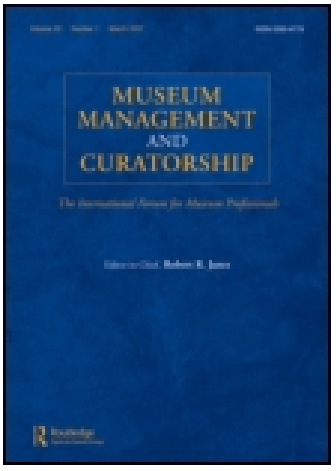

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Science exhibits for the young

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Science Exhibits for the Young

VICTOR J. DANILOV

Introduction

Young children often have a difficult time with museum exhibits, especially in the areas of science and technology—most exhibits simply are not developed to their scale, comprehension, and interest level. There is little opportunity for learning by playing, and the concepts sometimes are complex; as a result, museum-going can become an unpleasant and/or unproductive experience for pre-school and primary-school children. Recognizing these inherent problems, an increasing number of American natural history, science and technology, and children's museums have introduced special participatory exhibits for young boys and girls that deal with natural phenomena, scientific principles, and technological applications. These exhibits seek to stimulate the curiosity of the young, and to make it easy and interesting to touch, interact with, enjoy, and learn from the objects and other exhibit units. The concept of playful learning is not new. Many participatory science and children's museums have followed this precept for years, but it has been only in the last decade or so that the focus has been on special exhibits for the young.

Among the early museums with 'hands-on' science exhibits in the 1930s were the Museum of Science and Industry, Chicago, the Milwaukee Public Museum, the Franklin Institute Science Museum, Philadelphia, and the Cleveland Health Museum, but they did not have special early childhood exhibits. One of the first special science exhibits for the young was developed at the Schenectady Museum in upstate New York in 1960. It was an exhibition of cross-sections of common-place things and other objects, and Museum Director Donald S. Smith got the idea from his 9-year-old daughter who always was asking 'how and why' questions. Called 'Halls of Adventure', the exhibit consisted largely of cross-sections of items such as a baseball, parking meter, toaster, traffic light, clock, coconut, stalk of corn, and fire extinguisher. Among the other materials in the exhibit were a chick embryo, a plastic model of a human body, and various stuffed animals. Smith sought to show children 'the inside of a wide variety of things they see from outside'. The objects had to be things with which children were familiar, things which were interesting inside, and which were readily available at little or no cost.

Two other developments during this period merit mention—a science gallery at the Morristown (New Jersey) Junior Museum, and the Junior League House of Science in Binghamton, New York. The Morristown Museum, which opened in 1957, worked with local industries in installing a small science gallery with working models of an electromagnet, telephone, solar battery, and rocket engine. In 1961, the Binghamton Museum sought to 'challenge, inform, and inspire' children in the sciences with participatory exhibits on astronomy, weather, early flight, and space exploration, under

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the theme 'The Ocean of Air'. A museum journal report on the Schenectady project inspired the Children's Museum in Boston to produce a long-term exhibit, called 'What's Inside', that opened in 1963. Michael Spock, Director of the Children's Museum, organized the exhibit. This included elements as diverse as cross-sections of telephones, shells, beehives, and other such equipment and specimens; exhibit units on desert flowers, pre-natal development, and things found under the street (cobblestones, water mains, etc.); and a film taking a microscopic look at pond water. The exhibit continued for about five years and resulted in the development of other similar exhibits at the Boston Museum, including the popular 'City Slices' exhibit.

It was the success of these early exhibit experiments that led Richard Barthelemy, Public Education Coordinator at the James Ford Bell Museum of Natural History in Minneapolis, to develop in 1968 one of the first special hands-on natural history galleries built to the scale and comprehension of young children. In the years that followed, other natural history museums introduced similar early childhood exhibits. Many of today's special exhibits are known simply as 'Discovery Rooms', while others have such fanciful names as 'Science Playground', 'Kidspace', 'The Curiosity Place', and 'Playscape'. One institution even has the name 'Please Touch Museum'.

In most cases, the early childhood exhibit is located in a separate room with restricted access, usually open only to children of a certain age (commonly 7 or younger) and their parents. This keeps out older children who can be disruptive and intimidate the young. It also enables the museum to prevent overcrowding by limiting the number of children in the exhibit at any time. School and other groups normally have to make reservations, and generally are scheduled for morning hours. Individual children usually are scheduled for the afternoon, with time limits of 30 to 60 minutes being applied on busy days. The size, nature, and staffing of the exhibits vary considerably. The typical space is in the 1000–2000-square-foot range, although some exhibits are two or three times that size. The exhibit usually is staffed by volunteers, trained and supervised by a museum employee. The personnel number fluctuates with the size and content of the exhibit, as well as the number of children participating.

At natural history museums, exhibits for the young usually consist of mounted animals, plants, and boxes of fossils, arrowheads, feathers, minerals, bones, and other such objects that can be touched. Constructed participatory units containing mirrors, pulleys, musical devices, and other hands-on materials dominated early childhood exhibits at science and technology museums, while in children's museums science units frequently are mixed with non-science materials. These special exhibits for young children range from modest collections of specimens to more sophisticated experiential exhibit units. Despite the differences in content, the early childhood exhibits have a number of things in common:

1. they are usually special exhibits and areas designed to the scale, comprehension, and interest level of young children;
2. they generally are restricted areas, with participation limited to children in certain age categories;
3. they make extensive use of 'hands-on' exhibit techniques;
4. they seek to introduce youngsters to nature, science, and technology through playful and enjoyable experiences.

Some of the ways that individual museums seek to do a better job of serving pre-school and primary-school children follow.

Natural History Museums

The Discovery Room concept emerged largely from natural history museums—such as the James Ford Bell Museum of Natural History in Minneapolis in the late 1960s, and then at the National Museum of Natural History in Washington, the Field Museum of Natural History in Chicago, and the American Museum of Natural History in New York in the mid-1970s. Before long, the idea spread across the nation. Today, many natural history museums in the United States of America have exploratory exhibits that enable youngsters to touch animal skins, fossils, minerals, arrowheads, and other such objects and learn about the natural environment. At some natural history museums, two special exhibit rooms can be found—one for pre-school and primary-school children, and another for teenagers (and sometimes adults). In addition to discovery rooms for the young, for example, the Washington and New York museums have naturalist centers with more extensive specimen collections and more advanced participatory equipment.

James Ford Bell Museum of Natural History, Minneapolis. Affiliated with the University of Minnesota in Minneapolis, this museum developed in 1968 one of the first hands-on galleries, its 'Touch and See Room'. The 30 × 60 foot exhibition hall is designed to give pre-school and elementary-school youngsters a feeling of adventure and exploration, with outdoor color tones, subtle background sounds of the northern woods, and the unobtrusive display of exhibit materials distributed throughout the room. Loosely organized playthings, such as skins, horns, and skeletal parts, can be found on carpeted pedestals, inviting the young to touch and use their imaginations. The objective is to provide an enjoyable learning experience.

National Museum of Natural History, Washington. The Discovery Room at the Smithsonian Institution's National Museum of Natural History opened in the spring of 1974. It was followed in 1975 by a second specialized exhibit primarily for children—'The Naturalist Center'. The Discovery Room originally was intended to be a four-month research exhibit that documented and evaluated visitor curiosity about touching museum specimens, but the tactile project was so popular it became a permanent offering and now serves some 120 000 visitors annually. The room measures approximately 36 × 28 feet, and is bright and airy. The interior design was conceived to simulate the atmosphere of a library or study area, with quiet colors, plants, and a neutral carpet. Large objects, such as whale jawbones, are mounted on the walls, while other large specimens, such as the cannonball concretion, are on wheeled bases.

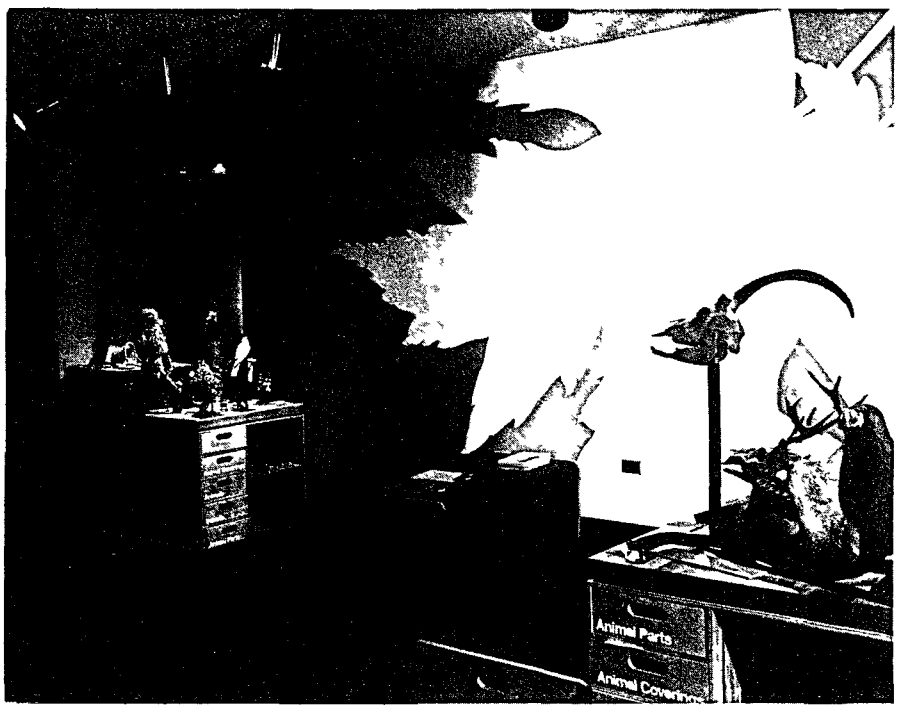
The Discovery Room basically has two types of exhibit materials—'stumpers' and 'discovery boxes'. Unusual natural history objects located around the room are called stumpers because they 'stump your imagination' and encourage the curious to ask questions, according to Patricia Barrows, Docent Director. Such objects range from giant bones to strange fossil plants, and about 25 discovery boxes enable youngsters to learn more about shells, molluscs, teeth, minerals, coral, trees, stones, beetles, reptiles, plankton, and other such subjects. The number of visitors is limited to 30 at any one time, and although intended mainly for young children, others are permitted into the room. It is open on a first-come first-served basis with visitors staying as long as they wish, except on weekends. Because of the exhibit's popularity on weekends, a ticket system limiting stays to a half-hour was instituted. The room is staffed by 60 volunteers. Two part-time staff members recruit and train the volunteers and technically maintain the exhibit.

1 Interior of the Discovery Room for young children at the National Museum of Natural History, which is part of the Smithsonian Institution in Washington, DC

The Naturalist Center is aimed at a higher age and intellectual level. Although primarily for those over 12, it also services younger children, according to Helene Lisy, Assistant Manager of the Taxonomically Oriented Facility. The center, which covers some 7500 square feet, looks more like a study or laboratory rather than an exhibit. The focal point is a collection of 25 000 specimens—sea-shells, minerals, insects, bones, and other such objects, mostly from the Washington area. The specimens, duplicates from the museum's extensive research collections, are kept in cabinets for examination by the visiting public. They are supplemented by videotapes and other self-learning guides. The exhibit is open every day and serves about 12 000 children and adults in a typical year. It is staffed by two museum employees and 60 volunteers, and needs at least three people to function.

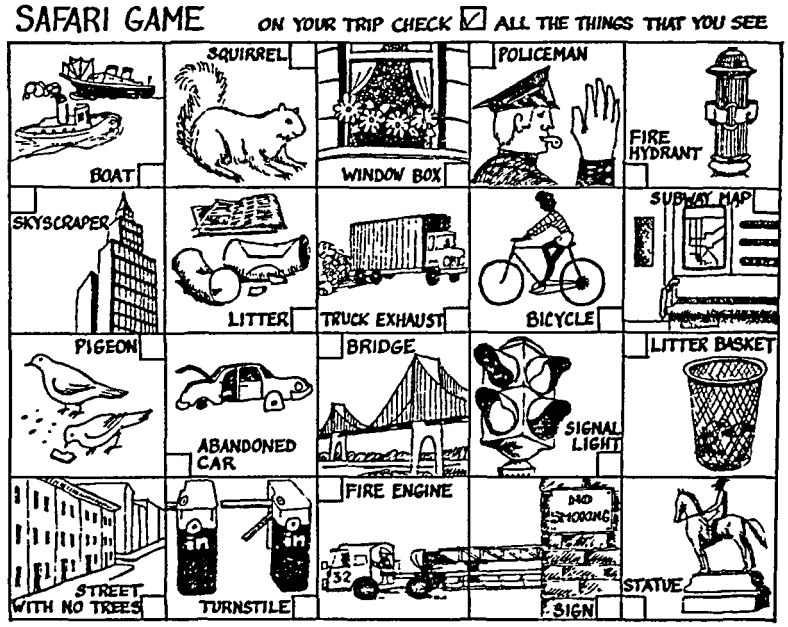
Field Museum of Natural History, Chicago. The 'Place for Wonder' opened around Christmas in 1975 at the Field Museum in Chicago. 'It is designed to connect museum visitors to exhibits through "real objects" and to develop observational skills', states Carolyn Blackmon, Education Chairman at the museum. Although a discovery room for all ages, it focuses on young children. The exhibit introduced two primary biological concepts: all life is full of diversity, and form follows function. The presentation of objects is organized to replicate the scientific disciplines and collections of the Field Museum—people, plants, animals, fossils, rocks, and minerals. 'The basic premise of learning theory [A. N. Whitehead] is explored', pointed out Ms Blackmon. 'There is a rhythm of learning, i.e. romance (undirected play, investigative curiousness), precision (directed toward cognitive skills), and generalization (ability to take and apply

knowledge to other situations—museum exhibits)'. Labelling of objects is minimal. When labels are used, they focus on inquiry—questions about objects that can be answered by observation and analysis. A volunteer and a staff member normally serve as facilitators to direct activity and handle inquiries. The room has a capacity of 50, with the school groups serviced in the morning, and an annual attendance of around 130 000.

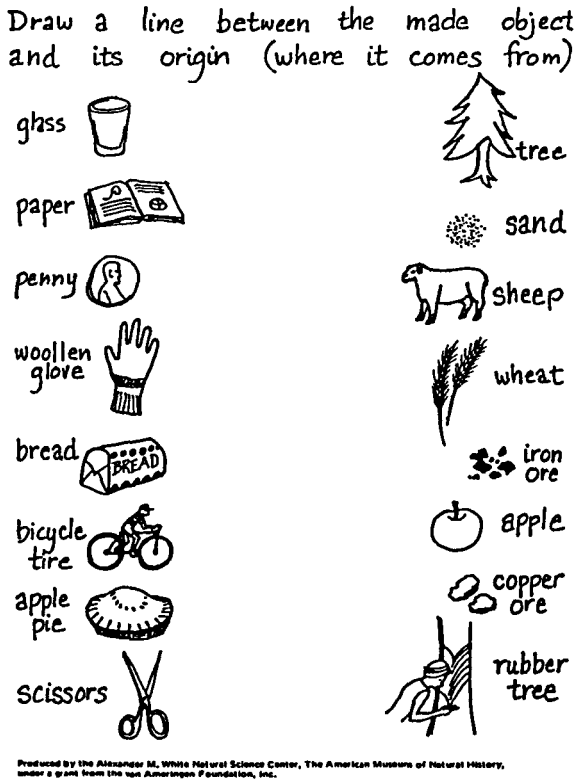


2. The 'Place for Wonder' at the Field Museum of Natural History in Chicago seeks to connect children to exhibits through the touching and observing of specimens from the museum's collections.

American Museum of Natural History, New York. The American Museum of Natural History has two special exhibits for children—the Discovery Room for children from 5 to 10 years of age, and the Alexander M. White Natural Science Center designed largely for youngsters at the third to sixth grade levels. The Discovery Room, which opened in 1977, occupies a 25 × 25 foot room with 24 discovery boxes, animal skins (lion, zebra, and wolf), and changing exhibits (on the Laps, masks, and other subjects). The boxes take two forms: four are 'feel and guess' boxes, with four subdivisions and containing such objects as a piece of shale, a crystal, a pine cone, and a show from India; and the remainder contain samples of sand, shells, birds, textiles, and other such mateials. The room accommodates 25 people at a time. Every child must be accompanied by an adult, with the objective being 'generation interaction', according to Marjorie Ranson, Education Supervisor, and admission is by ticket, with 40-minute time periods. The Discovery Room is open to the public on Saturdays and Sundays, and is used for special education purposes (e.g. the handicapped) on weekdays. It is closed for two months in the summer, but in a typical year about 2000 children are catered for on weekends and some 4000 on weekdays.



3. Among the educational materials produced by the Alexander M. White Natural Science Center at the American Museum of Natural History in New York are these game-like quiz sheets.



Launched in 1972, and redesigned in 1974, the Natural Science Center occupies some 2000 square feet and contains 13 exhibits. It is 'a teaching exhibit designed to awaken city children to the natural world surrounding them', explains Mary B. Croft, Senior Instructor. The exhibit units deal with such topics as fresh and salt water, city sounds, the air, geology, insects, building materials, underground pipes and cables, environment, and wildlife. It is possible to see small live animals, a starling, and plants and animals that live in the water. There is also space for changing exhibits. In addition, the American Museum of Natural History provides pre-visit and post-visit materials for teachers taking classes to the Natural Science Center. They include a filmstrip, map, and information about the museum and exhibit before the visit, and a record of city sounds and a specimen box with activity sheets. The 'Lookout' activity sheets seek to encourage students to focus on their own neighbourhoods and suggest that change is possible if they want to work at it. The 'Habitat' sheets are concerned with plants, trees, animals, insects, and birds that can be found on vacant lots and other outdoor locations in the city.

Science and Technology Centers

Contemporary science and technology museums—commonly known as science and technology centers—have approached the needs of young children somewhat differently. The emphasis has been largely on physical activity as a means of generating interest and demonstrating scientific principles and technological applications. Instead of examining specimens, youngsters engage in playful activities scaled to their size and comprehension—such as swings, mirrors, pulleys, shadow boxes, echo tubes, waterwheels, musical instruments, twirling turntables, and other such participatory units. Some of the special exhibits are restricted to pre-schoolers, while others are for children of all ages. They often resemble playgrounds and can be found outdoors as well as indoors.

The Exploratorium, San Francisco. One of the first attempts to develop a physics-based playground took place in 1977 at the Exploratorium in San Francisco. With the assistance of a mini-grant from the Association of Science-Technology Centers, two staff members, Charles Glorioso and Peter Richards, conducted a planning study which later influenced the development of science playgrounds at the Omniplex in Oklahoma City, the Franklin Institute Science Museum in Philadelphia, and the Pacific Science Center in Seattle, but failed to materialize into an exhibit at the Exploratorium itself. Safety was the primary concern of Glorioso and Richards in designing the equipment: 'We soon realized that to assure ourselves that the pieces were safe', they said, 'it was necessary to build full-scale mockups and then use them. The cost of building working prototypes limited the number of ideas that we were able to build'. Four different kinds of swings and a slice race were developed that could be built in a 'safe and educational manner'. The swings were the coupled pendulum, compound pendulum, moon swing, and variable-length swing. The slice race showed that a 40-foot long epicycloid slide transported a rider more quickly than a comparable straight slide. A number of other playground exhibit ideas were discussed and/or mocked up in small models as part of the study. These included a water cannon, balancing ball, sound mirrors, momentum machine, magnetic black sandbox, and momentum-transfer contest. But the lack of funds and appropriate space prevented the Exploratorium from implementing these ideas.

4. The Discovery Room at the Museum of Science in Boston includes both natural history and science/technology types of materials.

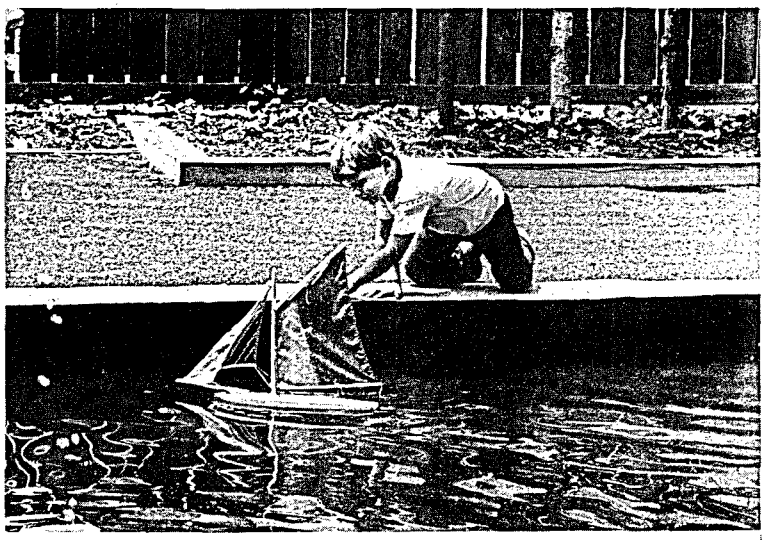
Museum of Science, Boston. In 1978, Boston's Museum of Science opened the first early-childhood exhibit at a science and technology center. The Discovery Room—originally named the 'Eye-Opener Room'—was established with the help of a grant from the Arthur D. Little Foundation. Creation of this room for 4- to 9-year-olds was aided by the fact that the museum covers natural history as well as the physical and life sciences. As Dorothy M. Connelly, an education staff member, explained, children can:

> classify items that are attracted or are not attracted to a magnet; make a record of their own height in centimeters and weight in kilograms to compare with those measurements the last time they came; see the image of their hands repeated many times in a panel of lenses; and observe what happens when a sprouting bean is turned on its side.

Youngsters may borrow or use a box of materials for making six or seven kinds of musical sounds, a box containing animal skulls, or a box with supplies to make a cast of a fossil. Instruments also are available to weigh objects, to view the structure of feathers, insects, and sand, and to play with mirrors that make them short, wide, and all legs.

Discovery Room items fall largely into four categories: growing things with bones, feathers, live plants, etc.; rocks and minerals; changing the way things look with mirrors, lenses, prisms, and colored films; and other things, such as magnets, gears, scales, and materials for sink-or-float experiments. The Museum of Science room is designed to achieve a relaxed exploratory learning environment, with a carpeted floor, furniture scaled for children, and space for individual and small-group activities. The room is staffed by two or three volunteers who greet the children, lend them magnifiers to use during their stay, make suggestions for discoveries, and answer questions. Approximately 3000 children make use of Boston's Discovery Room each year. The exhibit became so popular that tickets now are given to youngsters for half-hour periods. It is also possible for a teacher to reserve the room for a group of 30 children for 45 minutes. Dorothy Connelly points out:

> Children enjoy relating objects to themselves because they are still learning about their own capabilities and limits. They use all their senses to explore—learning from taste, touch, smell, and sound as well as sight; comparing and sorting,



5. Boat races are only one of the reasons why children love the 'Science Park' located outside the Franklin Institute Science Museum in Philadelphia.

6. Children listen to the 'Pipes of Pan' as they explore the wonders of physics in the 'Science Playground' at the Pacific Science Center, Seattle.

counting, putting into order, and identifying the scale of objects they have in hand. These experiences with real things encourage the development of observational skills—skills that can build a foundation for scientific knowledge and abstract thinking.

Franklin Institute Science Museum, Philadelphia. The Franklin Institute Science Museum has developed a 12 000-square-foot seasonal outdoor 'Science Park' that features about 40

exhibits, experiments, and demonstrations involving water, the sun, measurement, and physics. Different outdoor versions also can be found at the Science Museum in Bangkok (Thailand), the Nehru Science Centre in Bombay (India), and other museums where the weather makes year-round outdoor operation possible. Originally opened in 1976, the Park was revitalized and reopened in 1982 with grants from the J. Howard Pew Freedom Trust, CBS Corpration, and Grundy Foundation. It normally is open from late May through October.

Joel N. Bloom, Director of the Philadelphia Museum, said the Park was created to provide a facility where:

1. Science-based exhibits can be mounted that are not suited for installation inside the museum;
2. Museum education staff can organize activities and perform demonstrations not possible inside;
3. Younger visitors can engage safely in gross-motor activity;
4. Visitors of all ages can bring their lunch or snacks and eat in sun or shade, or simply sit and watch others play.

The planning goals were stated as follows:

> The atmosphere should be gay and pleasing, allowing for quiet moments as well as frenetic activity. The park as a whole should be designed for low daily maintenance. The park should be able to operate for short periods without supervision. The park should be designed so new exhibits can be added and old ones removed as funds and wear dictate. When closed at night, the park should be both safe and secure.

The Science Park is not an early-childhood project, but it has many features of interest to young children. For example, it is possible to climb into a giant 11½-foot high tire, ride an energy transfer swing, and hear how one's voice sounds through an 80-foot echo tube. An Archimedes' screw moves water uphill, pitch tubes convert park noise into the tones of a musical scale, and radio-controlled boats move from pool to pool. An electric pump and mister produce a rainbow when the sun cooperates, and there are siphon tanks, an overshot waterwheel, and a sundial. It is possible to take a walk and measure space, height, volume, tone, and the sun, and to transmit heat by touching a solar absorber. The park also contains a Lunar Excursion Module, an Atlas rocket, a battleship propeller, pressure tanks, canal locks, and parabolic arc bicycles.

Pacific Science Center, Seattle. In 1982, the Pacific Science Center opened an exhibit, titled 'Science Playground', aimed at children of all ages, with the emphasis on four major areas of physics—mechanics, sound, optics, and color. The exhibit includes a 72-foot long, 18-inch diameter tube for experimenting with echoes; a 12-foot high, 24-foot long lever that allows children to lift 550 pounds using different leverage ratios; 5-foot diameter parabolic dishes for capturing whispers across a room; and a 10-inch ball that floats above a high-volume air source that permits visitors to experiment with the Bernoulli ball effect.

It also has a cutaway manual transmission that can be viewed as the shaft is turned and the gears changes; spinning disks that can be stopped and made to do tricks by adjusting the rate of the strobe light; a 6 × 8 foot mirror used to explore bilateral symmetry; a color table for subtractive color mixing using filters; and a twirling turntable to explore the effects of center of mass and speed. Among other units in this special children's exhibit are a color room, large pulleys, a cartesian diver, momentum exchange, harmonic

pipes of pan, magic wand, parabolic mirror, polarized light, visual impairments, colored shadows, corner mirror, organ pipes, traffic light, and funhouse mirrors.

Impression 5 Museum, Lansing. The Impression 5 Museum in Lansing, Michigan, has developed an innovative 'Playground Physics' exhibit that it both uses and sells to other museums. It was field-tested as a traveling exhibit at four science museums in 1982 and installed at Impression 5 in 1983. The exhibit—made possible by a $70 000 grant from the National Science Foundation and other support—utilizes microcomputers with playground equipment. It consists of three units: a see-saw, a swing, and a slide.

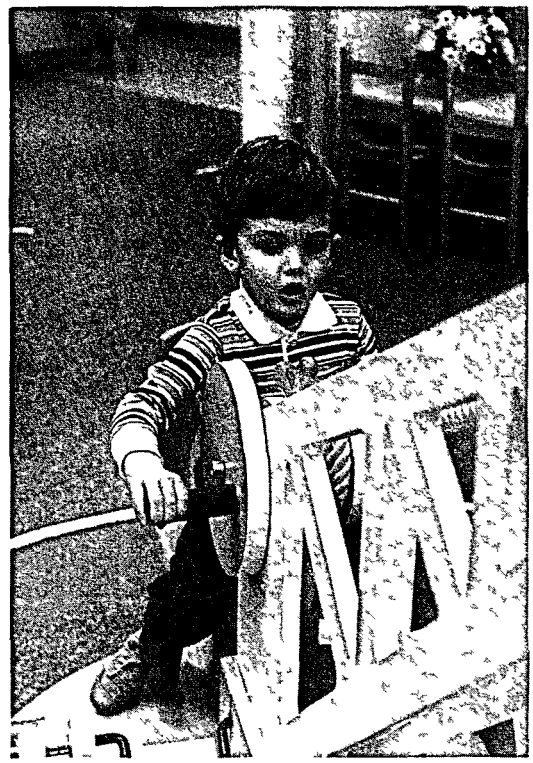
Museum Director Marilynne Eichinger listed the following four goals:

1. Playground physics—to learn some basic principles of mechanics related to specific playground apparatus;
2. Application to daily life—to experience the relevance of physics to everyday life, via the setting of a playground;
3. Scientific method—to have a greater understanding of the scientific method, including descriptions of independent and dependent variables, use of a constant, and the forming and testing of a hypothesis;
4. Computer literacy—to be exposed to the capabilties of a microcomputer, including text material presentation, interactive query/response, low- and high-resolution color graphics, sounds, and mathematical, geometric, and pictorial analysis.

The three-part exhibit is designed for fifth and sixth graders, but also appeals to younger children. The exhibit units also are being used by science museums in Baltimore, St Louis, and Alamogordo, New Mexico.

Museum of Science and Industry, Chicago. The idea for a pre-school science exhibit was conceived at Chicago's Museum of Science and Industry in 1974. But it was not until 1979 that the museum received a planning grant from the National Science Foundation to develop and test prototype exhibit units for children 3–6 years of age. Twenty-nine interactive exhibit units were developed in three areas—light; sound; and force, motion and machines. Cognitive objectives were to provide planned experiences which would encourage children to create relationships among events and objects; develop the ability to invent problems and look for solutions; practice creativity by thinking of different ways of doing something; and provide a basis for the later understanding of general principles and relationships. The NSF grant enabled the museum to develop and test many prototypes of potential exhibit units with a view to what would be effective and functional in a permanent facility for pre-schoolers. The success of the prototype exhibit led to the design and funding of the permanent exhibit, named 'The Curiosity Place', which opened in 1984.

Designed to encourage young children to learn by doing, the 2000-square-foot exhibit is divided into four areas containing interactive devices. In one section, two-way mirrors, a walk-in kaleidoscope, and a shadow screen teach children about the basics of light. Another area, containing musical instruments, a zylocoaster, speaking tubes, and a tone tower, provides an introduction to the world of sound. The concepts of force, machines, and motion are represented by the exhibit's child-powered crane, inclined planes and pulleys, double-pulley swings, and sand pendulum. Water play units comprise the fourth area. In each case, pre-schoolers are physically involved in the process of simple problem-solving to help them learn fundamental scientific principles. Included in the exhibit is a Parent/Teacher Resource Room where adults are encouraged



7. 'The Curiosity Place' at the Museum of Science and Industry in Chicago is a center of pre-school science activity, such as this young child operating a crane.

to utilize reference books, periodicals, discovery boxes, and children's books. They receive free take-home sheets on topics ranging from child development to science activities for use at home or school. Efforts have been made to include materials suitable for both the lay person and the professional.

In addition to the exhibit and its parent/teacher resource area, the museum's Kresge Science Library features a pre-school section of books and manipulative materials for young children, and, in an adjacent reading area, materials and resources for pre-school parents and teachers. These resources are cross-references to those in 'The Curiosity Place', which is staffed by a full-time coordinator and by volunteers drawn from local high schools, colleges and universities, parents of pre-schoolers, and the community at large.

Center of Science and Industry, Columbus. In 1985, the Center of Science and Industry in Columbus, Ohio, opened the first two sections of a major five-part early-childhood exhibit and program, called 'Kidspace'. The exhibit seeks to foster—through creative play—the aesthetic, emotional, cognitive, fine-motor, gross-motor, language, and personal-social development of young children during the critical ages of 2 to 7 years', explained Roy L. Shafer, President. One of the primary purposes of Kidspace is to expose young children to objects and animals from the real world and to encourage them to discover how things work. Another important focus of the exhibit is to further interactive learning between children and their parents or favorite grown-up.

Kidspace covers some 5000 square feet, and has five colorful theme areas—'Waterworks', 'Performing Arts', 'Animals', 'Science-Tech', and 'The Bin'. It is possible for youngsters to learn about the pleasures and wonders of water with plastic tubes,

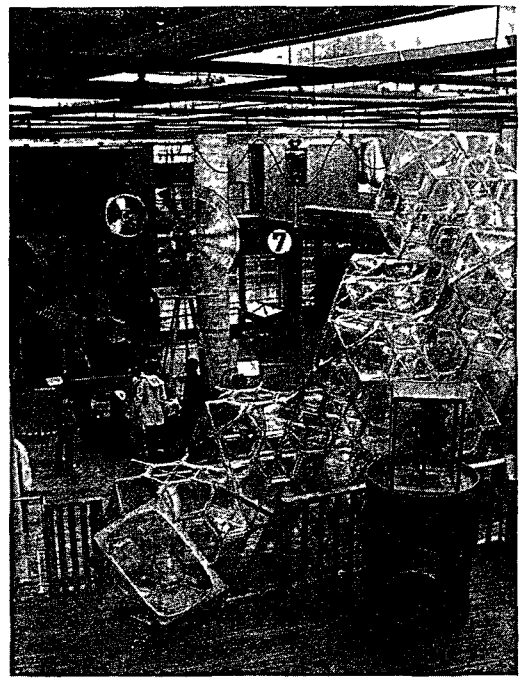
8. Youngsters enjoy 'hands-on' exhibits, such as this musical unit in 'Kidspace' at the Center of Science and Industry in Columbus, Ohio.

funnels, sieves, sponges, and corks; dress up and pretend to be firefighters, doctors, teachers, musicians, dancers, and other such people; touch, watch, pet, and experience all kinds of animals; and create a story and have a computer illustrate it. The Center of Science and Industry provides a worksheet for each area to help children and parents enhance their Kidspace experience. The sheets have subsections titled 'Why This?', 'Try This', 'Related Exhibits', 'Connections', 'At Home', 'About Town', and 'To Borrow or Buy'. The program is designed 'to foster parent–child, grandparent–child, teacher–child interaction—a blending of experiences which lead to exciting growth potentials for all parties involved', according to Shafer.

Oregon Museum of Science and Industry, Portland. 'Discovery Space' is the name of the newest early-childhood science exhibit opened in the fall of 1985 at the Oregon Museum of Science and Industry. An interactive exhibit area for children of 2½–7 years of age, 'Discovery Space' includes discovery boxes on such topics as levers, pulleys, and raceways, and a water canal system where children and parents can explore the effects of water levels, wave motion, and other properties of water. The area also contains a pre-school science library keyed to natural history materials featured in changing temporary exhibits for young children.

Children's Museums

Because of the nature of children's museums, early-childhood exhibits and activities are common at such institutions. However, relatively few have special science-oriented exhibit spaces. More often, a science exhibit unit or two are integrated into the overall program, as is the case at the Brooklyn Children's Museum, the Capital Children's Museum in Washington, the Denver Children's Museum, and The Magic House in St



9. The Brooklyn Children's Museum has a variety of science-oriented exhibits throughout the museum, rather than a special exhibit for the young.

Louis. However, among the museums with special exhibits that include science and technology are the children's museums in Boston, Indianapolis, Philadelphia, and Pittsburgh. At such institutions, children can find play-like exhibit areas especially created for young children—and their parents.

Children's Museum, Boston. As indicated earlier, the Children's Museum in Boston pioneered interactive science-oriented exhibits for the young, opening the 'What's Inside' exhibit in 1963. Today, it has a range of exhibits related to science and technology, such as the cutaway house exposing the plumbing, electrical work, and other behind-the-scenes aspects; computer terminals; and basic science exhibits. The Boston museum also has a special 'Playspace' exhibit that is, as the name implies, a place for children (5 years or younger) to play. It also is an environment in which children and parents can share and learn from each other. The 3500-square-foot exhibit is 'designed to support good parenting; to give children and parents something to do together', asserted Jeri Robinson, Director of the Early Childhood Program.

This exhibit space is filled with play-structured toys designed for infants, toddlers, and pre-schoolers. For parents and other adults, there is comfortable seating and a variety of resource boards with information about child development, child care, and family services. Adjoining is the Parent Resource Room, with books, toys, activity kits, and materials for parents to explore. The museum received a grant from the Carnegie Corporation in 1981 to support the development and implementation of a program exploring the issues of parenting in places families frequent in everyday living, such as shopping centers, supermarkets, clinics, and laundromats.

As part of the project, the museum is developing environments, programs, and materials within the museum to promote a positive climate in which parents and children can share, support, and learn from one another. It also is seeking to replicate these models in other natural settings. As a result, the museum has developed a 'Playscape at

Home' kit containing materials and instructions for 66 activities for young children, and 26 individual activity kits, called 'Kits for Kids', that have low-cost, reproducible activities that parents can use at home. Furthermore, the Boston museum has been instrumental in developing a parent–child visiting room at the Women's Prison in Boston, and is working on a playspace at Logan International Airport. In addition, it is helping the Milwaukee Public Library with its design for a similar space.

Children's Museum, Indianapolis. The 'Playscape' at the Children's Museum in Indianapolis is a gallery where children from 2 to 7 years of age have an opportunity to learn about other areas in the museum through play activities. It was stated in 1980. The exhibit is a sharing experience between adult and children. All children must be accompanied by a parent or some other adult, who may interact with the child in the activities, give support as the child plays, or simply observe, according to Kay Cunningham, Curator for Early Childhood Education. Playscape features seven play areas, each focusing on a specific subject: 'Water Works', 'Sand Dome', 'Reach Out and Touch', 'Magic Wall', 'Music Makers', 'Pretending to Be', and 'Let's Pretend'.

Please Touch Museum, Philadelphia. The Please Touch Museum in Philadelphia calls itself 'the only museum in the country designed specifically for children 7 years and younger'. Founded in 1976, it was housed at the Academy of Natural Sciences of Philadelphia. When the academy needed more space, the children's museum moved out and now occupies its own quarters. The museum has a number of science-oriented exhibits—a calliope exhibit about sound, and a nature center for watching and petting small animals. It also has a discovery center called the 'Resource Center' which is filled with books, games, objects, and kits. It is possible therefore children to examine fossils, rocks, and shells; explore the mysteries of electricity and magnetism; learn about dinosaurs; make a puppet; and find out about other cultures in the Resource Center, pointed out Portia Hamilton-Sperr, the Executive Director.

Pittsburgh Children's Museum. A new idea—an exhibit and program specifically created to serve children from birth to 2 years of age—has been introduced at the Pittsburgh Children's Museum. Called 'Playpath', it is a place where infants and smaller children can interact with special toys and learning aids designed to stimulate sensory development. Developed with the assistance of the Child Development Products Division of Johnson & Johnson, Playpath includes a number of motor skills devices, a slide-show illustrating the motor and conceptual development of children from infancy through toddler, and has two 'encounter' areas where parents and their babies are able to play together with educational toys. In addition, there is a 'warm line' for parents on child development run by the local Parental Stress Center. The idea came from two sources, according to David Crosson, Executive Director—his own desire to stimulate parents to think about the development of their infants, and the museum's exhibits designer, James Loney, who had developed gross-motor exhibits for pre-schoolers at other children's museums and wanted to extend the technique to infancy.

Exhibits in Other Countries

All this activity in the United States has been accompanied by similar developmental efforts around the world in the field of special exhibits for the young. The very first special exhibit area for children was actually opened at the Science Museum in London in

10. Dressing up and making believe are part of the Children's Museum in Indianapolis.

11. The Pittsburgh Children's Museum has introduced 'Playpath', a special exhibit for infants up to 2 years of age.

1931. The 'Children's Gallery' on the ground floor of the museum made wide use of dioramas, models, and push-button demonstrations—and was an instant success. The gallery has been updated and supplemented over the years, and was recently replaced with an entirely new participatory exhibit, covering some 10 000 square feet. The new 'Launch Pad' project, which opened in 1986, contains some 100 interactive exhibit units concerned with basic scientific and technological principles and applications. Although primarily for children, the exhibit seeks to serve visitors of all ages. 'People will come to Launch-Pad to enjoy themselves, to learn, and, we hope, to be inspired. We want it to

open new interests and enthusiasms, and to launch some young people towards new careers in technology and engineering', stated Dame Margaret Weston, then Director of the Science Museum. The £2½ million project is being funded by the Department of Trade and Industry, the Leverhulme Trust, and the Science Museum itself. One of the Sainsbury family charities also has made available sufficient funds to provide 'seed capital' for five or six similar ventures around the United Kingdom.

In 1977, the Royal Ontario Museum in Toronto, Canada began a 'Discovery Room' experiment. Tests were conducted to enable the public to examine materials from the museum's collections to determine whether the concept should be incorporated into the seen-to-be renovated and expanded natural history museum. The evaluation, consisting of attendance and use analyses, was positive, and the 1600-square-foot room continued to operate successfully until 1981, when the museum was closed for the removation. In due course, a new 2765-square-foot 'Discovery Gallery', with many new elements designed to complement the museum's overall theme, 'Mankind Discovering', was opened in 1983. The process of discovery, as exemplified in the museum, was featured in a new orientation exhibit. The Discovery Gallery—aimed primarily at children but open to all museum visitors—made it possible for museum-goers 'to understand the discovery process on an individual, rather than an institutional basis', Ruth Freeman, Gallery Coordinator, pointed out.

Among the original exhibit components used in the new exhibit were discovery box shelving units, identification drawer units, and the 'stumper' shelf. New elements included nine workstations; a tactile geology exhibit; and a 'forest' area with stylized trees housing bird and animal mounts and wood specimens (called 'Discovery Trail'). The gallery contains a range of artifacts and specimens that can be handled, such as a Chinese water-pipe, a horse's snowshoe, a 5000-year-old Egyptian perfume jar, a fossilized mammoth tooth, and discovery boxes with minerals, shells, and other such objects. The Discovery Gallery, which is open daily, normally accommodates 25 people at a time and has an average daily attendance of about 200, with adults sometimes outnumbering children.

A number of other museums in other countries also have special exhibit areas for the young. The 'Evoluon' in Eindhoven, The Netherlands, for example, has had a children's gallery since it opened in 1966. The National Museum of Science and Technology in Stockholm opened in 1985 a science center addition, called 'Teknorama', that includes a pre-school section. In Tokyo, the National Science Museum is adding a 4000-square-foot hands-on exhibit just for children.

Special science-oriented exhibits for children, especially at the early childhood level, are likely to become even more common in the future as museums seek to improve their services to young children. The examples sited in this overview indicate that it is possible under enlightened museum leadership. Exhibit areas designed and built to the scale, comprehension, and interest level of young children are a necessity if museums are to be more effective in reaching young minds in science and technology.